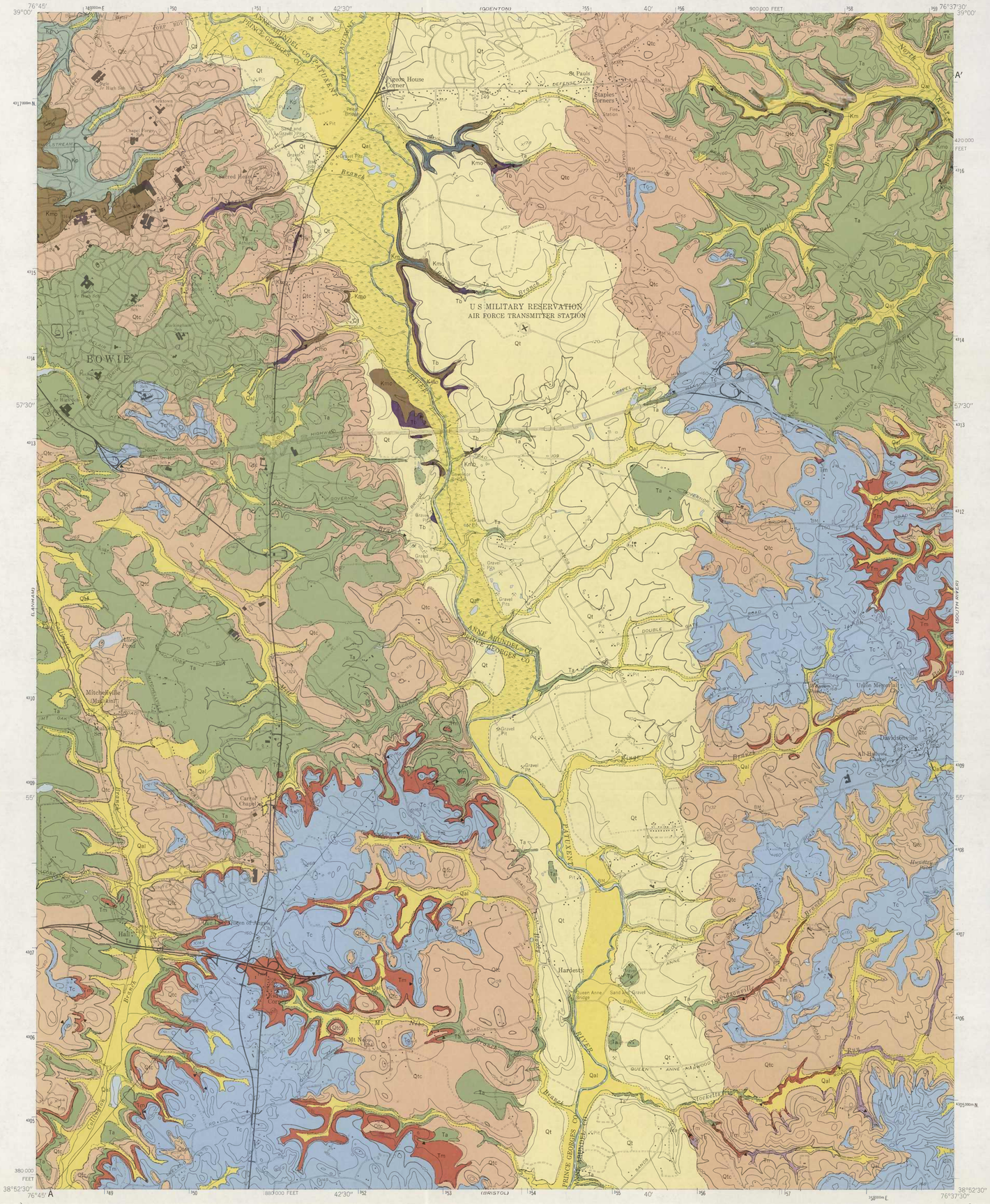
STATE OF MARYLAND
DEPARTMENT OF NATURAL RESOURCES
MARYLAND GEOLOGICAL SURVEY
Kenneth N. Weaver, Director

SYSTEM	SERIES	GROUP	FORMATION	THICKNESS IN FEET	DESCRIPTION
QUATERNARY	HOLOCENE		Alluvium	2 to 10	Interbedded poorly-sorted sand, silt, clay, and gravel; gravel mostly confined to Patuxent River floodplain deposits and those of other large streams such as Collington Branch and Stocketts Run. Color tan to yellow or brown where oxidized and non-glauconitic; gray or greenish-gray where glauconitic or rich in organic matter. Deposits contain common peaty silt or clay beds with leaves, branches, and logs. Sediments are glauconitic where derived from glauconite-bearing formations; include limonite-cemented layers or pods in places. This unit occupies stream channels, floodplains, and adjacent low areas; commonly marshy or at least water-saturated.
	PLEISTOCENE		Terrace deposits of minor streams and colluvium	3 to 15	Interbedded sand, silt, and minor amounts of clay and gravel; sand and pebbles nearly wholly quartzose but containing glauconite where immediate source materials are glauconitic. Tan, brown, or light-gray in color. Sand clean to very clayey; locally limonite-cemented forming blocks or ledges. Clay beds thin, lenticular, and not common. Terrace materials poorly-bedded to well-bedded; cross-bedded or laminated in places; colluvium massive. This unit is heterogeneous, including terraces and terrace remnants flanking minor streams, scattered patches of colluvium, and dissected terraces marginal to the Patuxent River but either too high or too distant from the modern channel for inclusion with Qt. These last are probably remnants of the oldest terraces associated with the Patuxent during its downcutting stage.
			Terrace deposits of Patuxent River	3 to 60	Interbedded sand, gravel, silt, and clay; gravel concentrated in lower portions. Pebble fraction almost wholly quartzose but containing scattered boulders of mafic crystalline rock; crystalline or quartzite boulders may reach 36 in. in diameter. Sediment color tan, brown, gray, or mottled; limonite-cemented conglomerate ledges locally common. Conspicuously glauconitic beds interbedded with quartzose beds in places. Clay beds are thin, lenticular, and uncommon. Sand mostly clean and fairly well-sorted but clayey sands are present in the upper terraces. The Patuxent terrace deposits range widely in thickness and in lateral extent from place to place along the River. Some terrace surfaces are underlain by only a few feet of sediment whereas other deposits are as much as 50-60 ft. thick; the average thickness is close to 20-25 ft. Sand and gravel units exhibit considerable cross-bedding and parallel bedding and are only rarely massive. Fossils other than plant remains are exceedingly rare in the Patuxent River Terrace Deposits; within the Bowie quadrangle, impressions of grasses and insect remains have been reported from a peaty bed at Hardesty.
TERTIARY	MIOCENE		Calvert Formation	5 to 50	Chiefly fine-grained sand, silt, and diatomaceous silt. Olive-green to olive-brown where least altered; pale-brown to dirty buff in weathered sections. Limonite staining or cementation conspicuous in very weathered outcrops. Bedding massive with abundant burrow mottling; impressions of mollusks common but shells never preserved. Basal beds of the Calvert contain some medium-grained sand and a 3 to 7 ft. thick layer of highly diatomaceous silt. Upper beds consist of variably clayey, very fine to fine-grained quartz sand and silt.
	EOCENE	PAMUNKEY GROUP	Nanjemoy Formation	2 to 30	Glauconitic sand, moderately to very clayey, poorly-sorted; silt; and dark-gray silty clay. Dark greenish-gray to bluish-green where unaltered; pale-brown or mottled brown and yellow in weathered outcrops. Sand fine to medium-grained, and containing as much as 50% of glauconite. Bedding massive or thick-bedded with conspicuous burrow-mottling. Impressions of mollusks scarce in map area. Beds or lenses of gray silty clay are interbedded with the more typical sand.
			Marlboro Clay	2 to 16	Plastic clay with silt partings. Pale-red, reddish-brown, or silvery-gray where unaltered and wet; pale-gray in dry, weathered sections. The basal few feet of the Marlboro and the uppermost few feet in most sections are gray in contrast to the reddish or pink tones characteristic of the rest of the unit. Scattered glauconitic-sand-filled borings are prevalent in places. Stratification is characteristically thin-bedded or laminated with abundant silt partings. Thin soils developed on the Marlboro often contain an abundance of small flat clay chips.
	PALEOCENE		Aquia Formation	25 to 110	Glauconitic sand, clean to moderately clayey; and calcareous sandstone. Well-sorted, medium-grained sand dominant but fine to coarse-grained in places. Dark gray-green or olive-green where unaltered, "salt and pepper" sand where moderately weathered, rusty brown with abundant limonite crusts and lumps where deeply weathered. Stratification massive or thick-bedded with abundant burrow-mottling. The Aquia is highly fossiliferous in places with large, well-preserved oysters dominant. Layers or pods of shelly calcareous sandstone up to 5 ft. thick are common, especially in the southern half of the quadrangle. Boulders and blocks of rusty limonitic sandstone are abundant in the soil zone developed on deeply-weathered Aquia and commonly litter the surface.
			Brightseat Formation	1 to 14	Sand, clayey, fine-grained, poorly-sorted, variably glauconitic. Dark-gray to dark greenish-gray where unweathered, pale-gray to brownish-gray in weathered outcrops. The Brightseat is essentially a graded sequence of sand and silt; the basal few feet contain considerable medium to coarse-grained sand as well as small quartz and phosphatic pebbles, shark teeth, and as much as 30% of glauconite. The relatively coarse lower portion grades rapidly upward to fine-grained clayey sand with little glauconite and ultimately to dense clayey micaceous silt. The abundance of mica is characteristic of the upper Brightseat as is a decided purplish cast when fresh; scattered shell impressions occur in places. The Brightseat Formation has not been previously mapped in eastern Prince Georges or in Anne Arundel County; its presence within the Bowie quadrangle was suggested by lithologic similarity with the Brightseat in its type area, and verified by palynological study.
CRETACEOUS	UPPER CRETACEOUS		Monmouth Formation	11 to 23	Sand, moderately clayey to clean, very fine to fine-grained, moderately well-sorted to well-sorted, variably glauconitic. Pale to medium-gray where unaltered, tan to mottled gray and yellow in weathered sections. The basal few feet of the Monmouth consist of poorly-sorted, fine to medium-grained sand with scattered quartz granules and pebbles (to 2 in. diameter), siderite concretions, shark teeth, and 10-15% of glauconite. The middle and upper portion of the unit varies from very-fine to fine-grained, well-sorted sand with as much as 40% of glauconite, to dense clayey fine micaceous sand and silt. In portions of the map area, a zone of large (to 6 ft. diameter) lobate or ellipsoidal ferruginous concretions mark the top of the formation. Fossils in the Monmouth are scarce in the Bowie quadrangle although pyritized casts of bivalves are occasionally encountered as are casts of the ammonite *Sphenodiscus lobatus*.
			Merchantville Formation	45 to 55	Sand, very fine-grained, and silt, poorly-sorted, very clayey, dense and compact. Dark-gray where unaltered, buff or pale-brown in weathered exposures. The sand is sparsely glauconitic (less than 5%), lignitic in places, and conspicuously micaceous. Stratified in thick beds or massive with abundant burrow mottling. Molds and casts of shells common throughout. Only the upper 25-30 ft. of the Merchantville is exposed in the Bowie quadrangle. Mapped with this unit is a 2 to 4 ft. bed of very well-sorted, medium-grained quartz sand which rests unconformably on the Merchantville in the vicinity of the Patuxent River between Pigeon House Corner and U.S. Route 50. The sand is white to yellowish-gray in color, subrounded to rounded, and is laced with well-preserved *Ophiomorpha* burrows; both upper and lower contacts are sharp and undulatory. This sand bed resembles portions of the Englishtown Formation which overlies the Merchantville in northeastern Maryland, and may be an erosional remnant of that unit.
	LOWER CRETACEOUS		Patapsco Formation	600	Sand, fine to coarse-grained; quartz gravel; and silty clay. White, pale-gray, or limonite-stained (orange to brown). Stratification lenticular or irregular. Sand moderately to very clayey; gravels with abundant white clay clasts. In the Bowie quadrangle, only the uppermost 15-20 ft. of the Patapsco is exposed.



Base map from U. S. Geological Survey, 1957 (Photorevised 1970) Bowie Quadrangle, 7½ Minute Series

Williams & Heintz Map Corporation, Washington, D. C. 20027

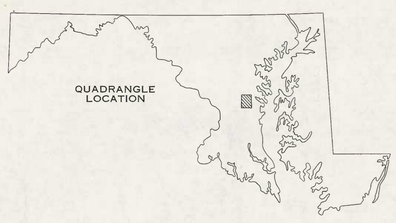
EXPLANATION

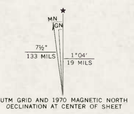
- HOLOCENE — QUATERNARY
  - Qal — Alluvium
  - Unconformity
  - Qtc — Terrace deposits and colluvium
- PLEISTOCENE — QUATERNARY
  - Unconformity
  - Qt — Terrace deposits
- MIOCENE — TERTIARY
  - Unconformity
  - Tc — Calvert Formation
- EOCENE — PAMUNKEY GROUP — TERTIARY
  - Unconformity
  - Tn — Nanjemoy Formation
  - Tm — Marlboro Clay
- PALEOCENE — PAMUNKEY GROUP — TERTIARY
  - Ta — Aquia Formation
  - Unconformity
  - Tb — Brightseat Formation
- UPPER CRETACEOUS — CRETACEOUS
  - Unconformity
  - Kmo — Monmouth Formation
  - Unconformity
  - Km — Merchantville Formation
- LOWER CRETACEOUS — CRETACEOUS
  - Unconformity
  - Kp — Patapsco Formation

Contact
Dashed where approximate, short dashed where indefinite

Fossil locality

Exposed contact





UTM GRID AND 1970 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

GEOLOGIC MAP OF BOWIE QUADRANGLE, ANNE ARUNDEL AND PRINCE GEORGES COUNTIES, MARYLAND

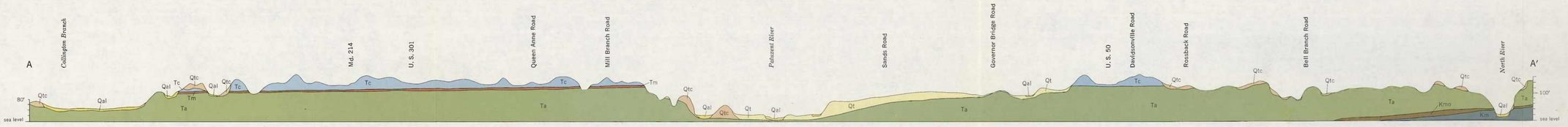
By
John D. Glaser
1973

SCALE 1:24000

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

CROSS SECTION A-A′
Vertical Exaggeration 10 x



REPRESENTATIVE GEOHYDROLOGIC DATA FOR THE BOWIE AREA

DEPTH	SINGLE POINT RESISTIVITY LOG	AQUIFER	QUALITY OF WATER					HYDROLOGIC PROPERTIES	
			pH	IRON (ppm)	HARDNESS AS $CaCO_3$ (ppm)	CHLORIDE (ppm)	DISSOLVED SOLIDS (ppm)	TRANSMISSIVITY (gal/day/ft)	STORAGE COEFFICIENT
Sea level		MAGOTHY (?)	4.0-5.4	1.0-5.3	6-18	2-8	62-86	20000	.0002
		"UPPER SANDS"							
		PATAPSCO							
		"LOWER SANDS"	5.3-6.0	3.2-9.6	5-13	2.0-8.5	54-96	15000-20000	.0003
		ARUNDEL CLAY							
		PATUXENT	4.8-6.1	1.4-3.6	2-13	4-10	52-72	10000	.0001

T.D. 1173 feet

REPRESENTATIVE GEOHYDROLOGIC DATA FOR THE DAVIDSONVILLE AREA

DEPTH	SINGLE POINT RESISTIVITY LOG	AQUIFER	QUALITY OF WATER					HYDROLOGIC PROPERTIES	
			pH	IRON (ppm)	HARDNESS AS $CaCO_3$ (ppm)	CHLORIDE (ppm)	DISSOLVED SOLIDS (ppm)	TRANSMISSIVITY (gal/day/ft)	STORAGE COEFFICIENT
Sea level		AQUIA	6.7-7.0	8.2	52-66	15	80-100	6500	not reported
		MAGOTHY	6.9-7.1	5.1-9.2	83-126	6-8	172	20000-30000	not reported

T.D. 354 feet

EXPLANATION

PG Cf 53 — Location of geohydrologic data well

AA Ec 5 / 30.3 — Location of Magothy observation well, with water level (in feet) above sea level.

0 — Structure contour with approximate elevation, in feet above sea level, of the top of the Magothy

60 — Approximate potentiometric surface of Magothy aquifer, in feet above sea level

SCALE 1:24000

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

GROUND-WATER RESOURCES OF BOWIE QUADRANGLE, ANNE ARUNDEL AND PRINCE GEORGES COUNTIES, MARYLAND

By
Harry J. Hansen
1973

STATE OF MARYLAND
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GENERAL CONSTRUCTION CONDITIONS OF BOWIE QUADRANGLE, ANNE ARUNDEL AND PRINCE GEORGES COUNTIES, MARYLAND

By
John D. Glaser
1973

SCALE 1:24000

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

EXPLANATION

- Floodplains; generally flat areas underlain by variable deposits of sand, silt, clay, and some gravel; organic material common; water table high; swampy conditions common; subject to flooding.
- Terraces; slopes gentle to moderate; underlain by sand-gravel deposits of variable thickness; generally well-drained.
- Areas underlain by thick, well-compacted, fine to medium-grained sand; slopes moderate to rolling; well-drained; materials readily excavated.
- Upland areas underlain by well-compacted, fine-grained clayey sand; slopes moderate to rolling; well-drained; materials readily excavated.
- Areas underlain by a thin (less than 20 feet) layer of hard plastic clay; essentially impermeable; moderately difficult of excavation.
- Stream valleys underlain by well-compacted deposits of sand, clay, and sandy gravel; materials irregularly interlayered; thickness greater than 500 feet; contains local concentrations of tough quartzite boulders; readily to moderately difficult of excavation.
- Areas underlain by thin (3 to 15 feet) deposits of loosely-compacted sand, clayey sand, and some small gravel; slopes moderate to moderately steep; mostly well-drained; materials readily excavated.
- Areas with rock ledges to several feet in thickness, distributed through the soil zone and at depth; composed of hard limy sandstone, shell rock, or friable ferruginous sandstone; discrete boulders or layers extending for tens or hundreds of feet.
- Steep (greater than 15%) slopes; mostly underlain by clayey sand or silt, but materials and degree of compaction may vary.

MARYLAND GEOLOGICAL SURVEY
Kenneth N. Weaver, Director

STATE OF MARYLAND
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MINERAL RESOURCES OF BOWIE QUADRANGLE, ANNE ARUNDEL AND PRINCE GEORGES COUNTIES, MARYLAND

By
John D. Glaser
1973

SCALE 1:24000

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

EXPLANATION

Sand and gravel

Terrace deposits, consisting largely of sand, subordinate gravel, and minor silt-clay interbeds; thickness variable, 10 to 60 feet. Composition chiefly medium to coarse-grained quartz sand, sporadically glauconitic, and medium quartzose gravel containing scattered cobbles and boulders of sandstone and crystalline rock.

Concentrations of generally thick (+ 20 feet) sand and gravel with minimal silt-clay interbeds; gravel concentrated in basal portion, clasts mostly less than 1 inch in diameter.

Clay

Clay deposits; generally 8 to 16 feet thick; suitable for face brick and structural tile.

Active sand and gravel pit

Inactive or abandoned sand and gravel pit

Williams & Heintz Map Corporation, Washington, D. C. 20027

MARYLAND GEOLOGICAL SURVEY
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DEPARTMENT OF NATURAL RESOURCES

CONSTRAINTS ON SEPTIC TANKS OF BOWIE QUADRANGLE, ANNE ARUNDEL AND PRINCE GEORGES COUNTIES, MARYLAND

By
John D. Glaser
1973

SCALE 1:24000

1 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 5 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

EXPLANATION

Areas underlain by hard plastic clay; essentially impermeable; absorption of septic effluents very poor.

Areas underlain by inhomogeneous deposits of sand, silt, clay, and minor gravel; generally poorly drained with high water table; flood hazard areas.

Areas underlain by medium to coarse sand and gravel; generally highly permeable materials; danger of polluting watercourses and shallow wells.

Areas with rock ledges in soil zone and at depth.

Minimal constraints.

Williams & Heintz Map Corporation, Washington, D.C. 20027

Environmental Geology of the Bowie Quadrangle

The geologic and interpretive maps of the Bowie Quadrangle have been prepared and issued as the initial contribution of the Baltimore-Washington Urban Area Study. Detailed surficial mapping was conducted during the summer and fall months of 1971 and completed in the spring of 1972. Conventional mapping techniques, involving examination and sampling of road cuts, stream banks, and artificial excavations, were employed. A 3 ft. soil auger was also used to obtain samples of fresh sediment from weathered exposures and in areas of sparse outcrop. Limited use was made of water-well records to obtain subsurface information. Laboratory studies, including textural and mineralogic analyses, were conducted on selected samples to provide compositional data and to evaluate physical properties of the various geologic units in the quadrangle. Palynological study of several samples was undertaken by Dr. G. J. Brenner of State University College, New Paltz, N.Y., to confirm the stratigraphic identity of the Merchantville, Monmouth, and Brightseat Formations.

The information developed during the course of the geologic investigation was then used to prepare a number of interpretive maps. The first of these, depicting general construction conditions, reflects firstly the type of earth materials at the surface. Secondary but nonetheless important criteria include slope, flood hazard, degree of compaction, and water table level. Careful consideration of all of these factors led to the subdivision of the map area into nine categories of terrain, each with distinctive characteristics with respect to excavation and foundation limitations.

The second map of the folio, detailing geologic constraints on septic systems, integrates the same raw geologic data to delineate four kinds of problem areas for septic tank construction. Such problem areas exist over less than half of the Bowie quadrangle; the remaining area presents minimal constraints.

The mineral resources map shows the distribution of potentially exploitable sand and gravel deposits, and the outcrop belt of a bed of brick clay. These materials are the only mineral deposits of economic value in the quadrangle. Sand and gravel is presently dug or has been dug in the past at numerous locations within the region. Both active and abandoned pits were located by on-site inspection and on aerial photographs, and are outlined on the mineral resources map. The suitability of the clay (Marlboro Clay) for face brick and structural tile was determined by the U.S. Bureau of Mines based on firing tests performed on bulk samples.

The final interpretive map in the folio, a summary of the geohydrology of significant aquifers in the quadrangle, was prepared by H. J. Hansen of the Survey staff. Shown are structure contours and the potentiometric surface on the Magothy aquifer, which is the most reliable source of water for all classes of use within the quadrangle. In addition, tables giving water quality data and hydrologic properties for the Magothy, Aquia, and Potomac Group aquifers are appended to the map.

Groundwater Resources of the Bowie Quadrangle

by

Harry J. Hansen

The wedge of Coastal Plain sediments beneath the Bowie Quadrangle increases in thickness southeasterly from approximately 1,000 feet to 1,500 feet. Several sandy formations within this wedge transmit water readily to pumping wells and are called aquifers. From shallowest to deepest they are the Aquia, the Magothy, the Patapsco, and the Patuxent; the latter two are multi-aquifer formations inasmuch as each contains several sands that often function as discrete hydrologic units. The accompanying map and charts provide geohydrologic data useful for groundwater planning and management. In the following paragraphs each aquifer is briefly described within the framework of these geohydrologic parameters.

Aquia Aquifer: The Aquia aquifer is a "muddy" sand containing interbeds of sandy limestone (see geologic map). It crops out over much of the Bowie quadrangle, functioning as a water-table aquifer. Of the aquifers underlying the quadrangle it is the least transmissive, probably not exceeding 6,500 gallons per day per foot. As a rule of thumb, transmissivity can be translated into pumpage (in gal per min) per foot of water-level decline (i.e. "specific capacity") by using a divisor of 2,000. Thus, Aquia wells should not be expected to yield more than three gallons per minute per foot of water-level decline. Inasmuch as the aquifer is at or near the surface, the amount of available drawdown is limited, probably not exceeding 100 feet in many areas. Efficiently constructed Aquia wells may, therefore, at their very best yield several hundred gallons of water per minute. However, because of the greater productivity of the deeper aquifers, particularly the Magothy, few if any, high-capacity Aquia wells are drilled in the Bowie quadrangle.

The natural quality of Aquia groundwater is acceptable by Public Health Service standards with one important exception—iron. In the Bowie quadrangle the dissolved iron content usually exceeds the recommended limit of 0.3 parts per million (ppm), often reaching concentrations of 5.0 ppm or more. Dissolved solids, including chlorides, occur in concentrations well below the PHS limit. Aquia groundwater is only moderately hard, reflecting the fact that acid soil waters percolating through the aquifer have already leached away much of the fossil shell material in the formation. In Prince Georges County, where the Aquia outcrops extensively, it is particularly vulnerable to pollution from septic tanks, drain fields, landfills, or agricultural chemicals such as fertilizers and pesticides. Conversely, in Anne Arundel County the Aquia is usually capped by overlying formations, thereby minimizing the possibility of contamination from surface sources.

The Aquia aquifer is the least attractive of the several aquifers underlying the Bowie quadrangle. Its relatively low transmissivity and limited available drawdown combine to inhibit the construction of high-yield wells. Also, as the Aquia aquifer outcrops extensively in the quadrangle, it is therefore more vulnerable to the encroachment of contaminants, particularly in unsewered subdivisions.

The Aquia aquifer can, however, be used to advantage in the southeastern part of the quadrangle where it has dipped beneath the Nanjemoy and Calvert Formations and is artesian. Here the aquifer reaches its greatest depths, thus maximizing available drawdown and minimizing the threat from surface pollutants. Still, the aquifer should be considered adequate only for domestic and light commercial use.

Magothy Aquifer: Although it is overlapped in outcrop by younger formations, the Magothy aquifer underlies much of the Bowie quadrangle. The sand labelled Magothy in the Bowie area well log is lithologically distinct and its relationship to the "type" Magothy occurring down the dip is not fully understood. It may be an updip facies of the "type" Magothy or, perhaps more likely, an upper sand of the underlying Patapsco Formation. Although the the Magothy (?) at Bowie is stratigraphically moot, it may indeed be hydraulically connected to the "type" Magothy that underlies the rest of the quadrangle. Consequently, it is included in this discussion.

The Magothy aquifer provides only a small percentage of the water consumed by the city of Bowie. Pumpage, which is reported to be as much as 6 million gallons per day, comes largely from deeper Patapsco and Patuxent wells. In Prince Georges County the Magothy aquifer is primarily used by the commercial facilities bordering U.S. 301. This usage pattern will largely be superseded, however, as surface water imported into the area by Washington Suburban Sanitary Commission (WSSC) becomes more widely distributed. Already a trunk transmission main reaches Route 301 via Central Avenue (Md. 214). Additional ingress to the area is planned via Route 50 and the Mt. Oak-Mitchellville Road corridor. In the near future Magothy pumpage will be chiefly confined to the area east of Route 301, including the State Park lands being acquired along the west bank of the Patuxent River.

The Anne Arundel County part of the Bowie quadrangle is a "rural" water service area. Light density development is foreseen for the next 25 years and as a consequence public utilities are not presently being planned. Here individual water systems will predominate and most will be supplied from either Magothy or Aquia wells.

Of the two aquifers the Magothy is the more productive. Transmissivities range between 20,000 and 30,000 gallons per day per foot, suggesting that individual wells, if efficiently constructed, might be expected to have specific capacities of perhaps 10 gallons per minute per foot of drawdown.

The accompanying map exhibits two sets of generalized contours. One is a structural contour map showing the depth (in feet above or below sea level) to the top of the Magothy aquifer. Broadly speaking, the aquifer dips southeastward from shallower than +50 feet to deeper than −200 feet. The other set of contours is a potentiometric map showing the static level to which water will rise in a Magothy well. In the Bowie quadrangle the Magothy aquifer is artesian so the potentiometric contours describe everywhere a higher surface than the structure contour map. The footage between the two sets of contours defines the "available drawdown" in a pumping well. The potentiometric contours in the Anne Arundel County part of the quadrangle are based on the April, 1970, measurements of several Magothy observation wells. Comparable data are not available for Prince Georges County. Unverified levels from well completion reports were used to extend the contours west of the Patuxent River; there, data lack rigorous control and are useful only to show general trends.

Evidence suggests that the Magothy aquifer is capable of supporting high-capacity wells yielding 500 gallons per minute or more in areas of the quadrangle where available drawdown exceeds 50 feet. Such areas are largely south of U.S. Route 50 and east of U.S. Route 301. Inasmuch as neither the WSSC nor the Anne Arundel County Department of Public Works is now planning to import surface water into this area, the Magothy aquifer will be increasingly utilized.

Like the Aquia, the Magothy aquifer exhibits relatively high dissolved iron concentrations, requiring removal for most purposes. In up-gradient areas such as Bowie the water is acidic (pH = 4.0-5.4) and very soft; pH adjustment is recommended to make the water less corrosive. Down dip natural buffering occurs, pH is adjusted upward, and the water becomes moderately hard; data for the Davidsonville area provide evidence of such a hydrochemical change.

Patapsco and Patuxent Aquifers: In the Bowie quadrangle the Potomac Group can be subdivided into an upper suite of sands called the Patapsco Formation and a lower suite of sands called the Patuxent Formation. The differentiation is made possible by the occurrence of a thick and persistent clay called the Arundel Formation. Both the Patapsco and the Patuxent are multi-aquifer units; that is, both consist of several sand beds, each generally less than 100 feet thick, which are separated by clayey strata. The Bowie area well log accompanying this description illustrates the complexity of the Patapsco and Patuxent Formations.

The city of Bowie, which operates its municipal services independent of the WSSC, pumps chiefly from the Patapsco and Patuxent aquifers; although deeper, the latter is preferred because its dissolved iron content is usually less. It is reported that Bowie pumps as much as 6 million gallons per day. The part of the city using groundwater is, however, reaching maximum development so additional stress on the aquifers will be limited. In fact the city is already using some WSSC water, further suggesting that in the future pumpage will stabilize or even decrease. Any decrease in pumpage at Bowie may, however, be offset at Crofton, an expanding community located along U.S. Route 301 just north of the Bowie Quadrangle. Crofton has wells screened in both the Patapsco and Patuxent aquifers and now pumps nearly 1 million gallons per day during peak demand periods.

Specific data for the Patapsco and Patuxent aquifers are lacking except for the deep wells at Crofton and in the Belair section of Bowie. Regional investigations suggest, however, that sands similar to those identified at Bowie persist beneath the rest of the quadrangle, becoming deeper southeastward. For example, in the southeast corner of the quadrangle the top of the Patapsco Formation, Patuxent Formation, and Piedmont-type "basement" rocks would occur at about 350 feet, 1,200 feet, and 1,500 feet below sea level, respectively.

The individual sands of the Patapsco and Patuxent Formations are not so productive as the Magothy aquifer. However, the specific capacity of wells can be increased by screening more than one sand, a procedure followed at Bowie and recommended for other localities in the quadrangle where high-capacity wells are needed. Multi-screened wells report transmissivities of 10,000 gallons per day per foot for the Patuxent sands and 15,000 gallons per day per foot for the lower Patapsco sands. Inasmuch as wells completed in these aquifers are relatively deep, pump settings of 250 or more feet are feasible. Under these circumstances wells yielding 500 to 1,500 gallons per minute can be reasonably anticipated.

As previously mentioned, both the Patapsco and the Patuxent aquifers contain obnoxiously high concentrations of iron that require removal. At Bowie, however, the lower Patuxent sands contain considerably less iron (0.14-3.6 ppm) and are preferable from that point of view. Down gradient, in the eastern and southern parts of the quadrangle, the Patuxent aquifer may have even lower iron concentrations as pH values adjust upward. Total dissolved solids, chiefly sodium bicarbonate, may approach 1,000 ppm. Since the sands of the Potomac Group are devoid of fossil shells and contain no limestone beds, their groundwaters are very soft. Hardness values (as $CaCO_3$) are low, reportedly less than 15 ppm. Beneath the Bowie quadrangle the Coastal Plain sediments are believed to contain only fresh water; at Bowie, for example, the chloride content of even the deepest sands is very low (4-10 ppm). As the Patuxent Formation dips southeastward both dissolved solids and chlorides can be expected to increase in concentration. It would be surprising, however, to encounter waters containing more than 250 ppm chloride, the recommended upper limit for potability.

Additional references containing water-resources data pertinent to the Bowie quadrangle and its surrounding area include:

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BOWIE QUADRANGLE

Geologic and Environmental Atlas

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